CLAIMS

1. An apparatus of applying ultrasonic vibration to a resin material which applies the ultrasonic vibration to the resin material in a molten state, the apparatus comprising:

a vibrator which applies the ultrasonic vibration to the resin material, or a vibration transmission member which transmits the vibration of the vibrator to the resin material,

wherein the vibrator or the vibration transmission member is disposed in a channel of the resin material in such a manner as to bring the vibrator or the vibration transmission member into contact with the resin material; and

vibration transmission inhibition means is disposed in such a manner as to substantially inhibit members other than the resin material from being vibrated by the vibration of the vibrator or the vibration transmission member.

2. The apparatus of applying the ultrasonic vibration to the resin material according to claim 1, wherein a member having high adhesive properties to the resin material is selected as the vibrator or the vibration transmission member.

3. The apparatus of applying the ultrasonic vibration to the resin material according to claim 1 or 2, wherein the vibrator or the vibration transmission member

is positioned so as to transmit the vibration in a direction crossing a flow direction of the resin material at right angles.

4. The apparatus of applying the ultrasonic vibration to the resin material according to any one of claims 1 to 3, wherein the vibration transmission inhibition means is an elastic member interposed between the vibrating member or the vibration transmission member and the other member.

5. The apparatus of applying the ultrasonic vibration to the resin material according to claim 4, wherein a connecting portion which connects the vibrating member or the vibration transmission member to the other member is progressively formed in a node portion of the vibration transmitted inside the vibrating member or the vibration transmission member, and the elastic member is interposed between the connecting portion and the other member.

6. The apparatus of applying the ultrasonic vibration to the resin material according to claim 4 or 5, wherein $E < 0.3Eh$ is satisfied wherein Eh is an elasticity of the vibrating member or the vibration transmission member, and E is an elasticity of the elastic member.

7. The apparatus of applying the ultrasonic vibration to the resin material according to any one of

claims 1 to 3, wherein the vibration transmission inhibition means is a gap interposed between the vibrating member or the vibration transmission member and the other member.

8. The apparatus of applying the ultrasonic vibration to the resin material according to claim 7, wherein a size of the gap is set to 0.05 mm or more and 0.5 mm or less.

9. The apparatus of applying the ultrasonic vibration to the resin material according to any one of claims 1 to 8, wherein a vibration-applied surface, on which the vibrating member or the vibration transmission member contacts the resin material to apply the vibration thereto, is subjected to surface processing and/or surface treatment for improving the adhesive properties of the resin material.

10. The apparatus of applying the ultrasonic vibration to the resin material according to claim 9, wherein the surface processing or the surface treatment is formation of concave/convex portions or grooves, plating, coating of an adhesive properties improver, flame spraying, or a combination of them.

11. The apparatus of applying the ultrasonic vibration to the resin material according to claim 10, wherein the adhesive properties improver is maleic anhydride or a composition of malefic acid.

12. The apparatus of applying the ultrasonic vibration to the resin material according to any one of claims 1 to 11, wherein the vibrator or the vibration transmission member is a horn having any shape of a columnar shape, plate shape, ring shape, circular cone shape, truncated cone shape, conical shape, exponential shape, rectangular parallelepiped shape, cube shape, and a shape in which a slit, cut or flange is formed on any one of these shapes.

13. The apparatus of applying the ultrasonic vibration to the resin material according to claim 12, wherein the plurality of horns are arranged in series or in parallel along the channel.

14. The apparatus of applying the ultrasonic vibration to the resin material according to claim 12, wherein the plurality of horns are arranged around the channel, and the vibration is applied to the resin material from different directions.

15. The apparatus of applying the ultrasonic vibration to the resin material according to any one of claims 1 to 14, wherein the channel is formed in one of a cylinder of an extrusion machine or an injection molding machine, a cylinder of an extruder or a kneader, a chamber, a downstream side from an outlet of the cylinder, and a mold.

16. The apparatus of applying the ultrasonic vibration to the resin material according to any one of claims 1 to 15, wherein the resin material is one of a mixture of two or more resins and/or elastomers, and a mixture of a resin and/or an elastomer and a filler.

17. A method of kneading, compounding and blending a resin material, comprising the steps of:

disposing the ultrasonic vibration applying apparatus according to any one of claims 1 to 16 in a channel through which the resin material having a molten state flows; and

applying the ultrasonic vibration to the resin material which flows through the channel from a direction crossing a flow direction of the resin material at right angles;

the application of the ultrasonic vibration through the vibrator or the vibration transmission member being performed under conditions that members other than the vibrator or the vibration transmission member are not substantially vibrated.

18. A resin composition produced by use of the ultrasonic vibration applying apparatus according to any one of claims 1 to 16.

19. The resin composition according to claim 18, which is produced by mixing two or more thermoplastic resins and/or elastomers, wherein an interface is formed between the mixed thermoplastic resins, and one

thermoplastic resin oozes like a feather into the other thermoplastic resin in the interface.